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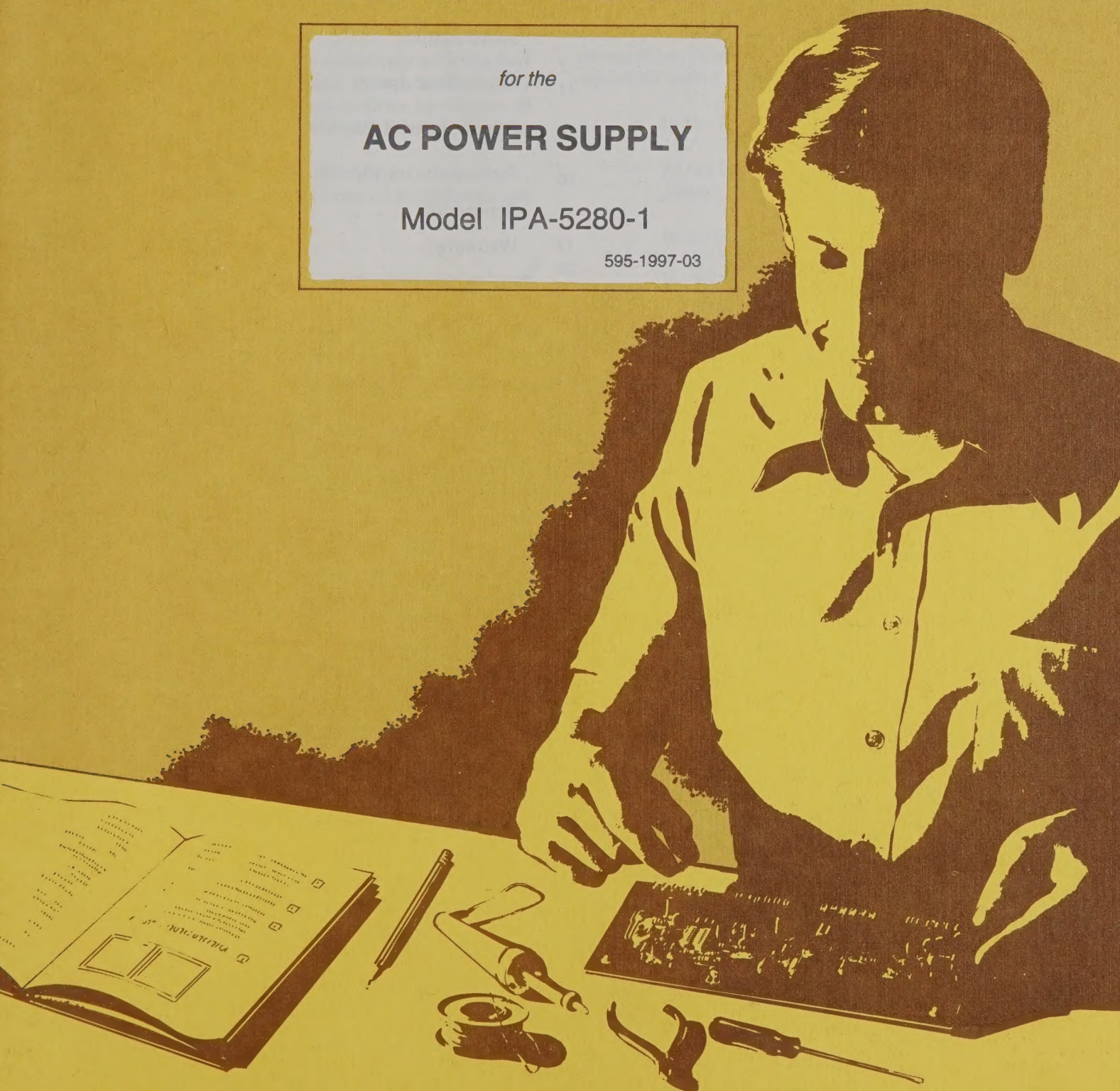
# HEATHKIT<sup>®</sup> MANUAL

*for the*

**AC POWER SUPPLY**

**Model IPA-5280-1**

595-1997-03



HEATH COMPANY • BENTON HARBOR, MICHIGAN



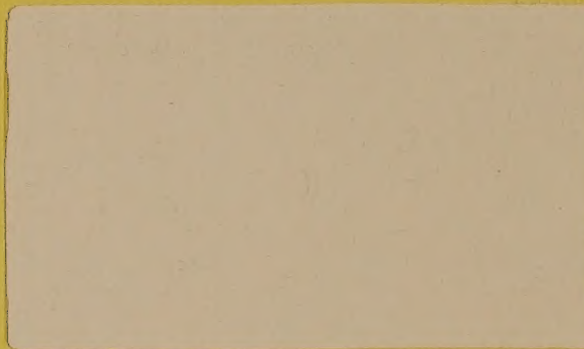
## HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information ..... (616) 982-3411  
Credit ..... (616) 982-3561  
Replacement Parts ..... (616) 982-3571

### Technical Assistance Phone Numbers

8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only  
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Amateur Radio ..... (616) 982-3296  
Test Equipment, Weather Instruments and  
Home Clocks ..... (616) 982-3315  
Television ..... (616) 982-3307  
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Operating Systems, Languages, Utilities ..... (616) 982-3860  
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## YOUR HEATHKIT 90-DAY LIMITED WARRANTY

### Consumer Protection Plan for Heathkit Consumer Products

Welcome to the Heath family. We believe you will enjoy assembling your kit and will be pleased with its performance. Please read this Consumer Protection Plan carefully. It is a "LIMITED WARRANTY" as defined in the U.S. Consumer Product Warranty and Federal Trade Commission Improvement Act. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

#### Heath's Responsibility

**PARTS** — Replacements for factory defective parts will be supplied free for 90 days from date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. You can obtain warranty parts direct from Heath Company by writing or telephoning us at (616) 982-3571. And we will pay shipping charges to get those parts to you . . . anywhere in the world.

**SERVICE LABOR** — For a period of 90 days from the date of purchase, any malfunction caused by defective parts or error in design will be corrected at no charge to you. You must deliver the unit at your expense to the Heath factory, any Heathkit Electronic Center (units of Veritechnology Electronics Corporation), or any of our authorized overseas distributors.

**TECHNICAL CONSULTATION** — You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

**NOT COVERED** — The correction of assembly errors, adjustments, calibration, and damage due to misuse, abuse, or negligence are not covered by the warranty. Use of corrosive solder and/or the unauthorized modification of the product or of any furnished component will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, loss of use, customer assembly, set-up time, or unauthorized service.

This warranty covers only Heath products and is not extended to other equipment or components that a customer uses in conjunction with our products.

SUCH REPAIR AND REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF HEATH FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORSEEABLE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

#### Owner's Responsibility

**EFFECTIVE WARRANTY DATE** — Warranty begins on the date of first consumer purchase. You must supply a copy of your proof of purchase when you request warranty service or parts.

**ASSEMBLY** — Before seeking warranty service, you should complete the assembly by carefully following the manual instructions. Heathkit service agencies cannot complete assembly and adjustments that are customer's responsibility.

**ACCESSORY EQUIPMENT** — Performance malfunctions involving other non-Heath accessory equipment, (antennas, audio components, computer peripherals and software, etc.) are not covered by this warranty and are the owner's responsibility.

**SHIPPING UNITS** — Follow the packing instructions published in the assembly manuals. Damage due to inadequate packing cannot be repaired under warranty.

If you are not satisfied with our service (warranty or otherwise) or our products, write directly to our Director of Customer Service, Heath Company, Benton Harbor MI 49022. He will make certain your problems receive immediate, personal attention.



# Heathkit® Manual

for the

## AC POWER SUPPLY

Model IPA-5280-1

595-1997-03

SERIES 03-57119

INVOICE # 337506-03

DATE 09/09/85

HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022

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## INTRODUCTION

The Heathkit Model IPA-5280-1 AC Power Supply provides well regulated, low voltage DC (+9 volts and -9 volts) from either a 120 or 240-volt AC power source. It is designed to power the Heathkit Model 5280 instrument series. Five output cables with connectors are supplied for quick, easy connections.

This power supply will provide years of dependable service. The compact cabinet design matches the instrument series cabinets.

The type 5280 series includes this Power Supply and several other kits. The other kits in the series are designed to operate from this Power Supply or from batteries. If you have purchased the Model IM-5284 Multimeter, and build it first, it will be available to check the other kits as they are assembled. If you build the Power Supply first, you will avoid the need for batteries.



## PARTS LIST

Check each part against the following list. The key numbers in the Parts List correspond to the numbers on the Parts Pictorial (Illustration Booklet, Page 1). Parts may vary slightly from the illustrations; only the hardware is shown actual size.

Some parts are packaged in containers with the part number marked on the outside. Except for the initial parts check, keep these parts in their containers so they can be easily identified when they are called for in the assembly steps.

Save all packaging material until all parts have been located.

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear

cover of this Manual. For prices, refer to the separate "Heath Parts Price List."

Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

- In the Parts List,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the Schematic,
- In the sections at the rear of the Manual.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

### RESISTORS — CAPACITORS

A1	6-1471-12	2	1470 $\Omega$ (1.47K) (brn-yel-viol-brn), 1% precision, 1/4-watt resistor	R2, R3
A1	6-2370-12	2	237 $\Omega$ (red-org-viol-blk) 1% precision, 1/4-watt resistor	R1, R4
B1	25-880	2	10 $\mu$ F electrolytic capacitor	C3, C4
B1	25-891	2	470 $\mu$ F electrolytic capacitor	C1, C2

### OTHER ELECTRONIC COMPONENTS

C1	45-81	1	2.9 mH choke	L1
C2	54-257	1	Transformer	T1
D1	57-65	2	1N4002 diode	D1, D2

NOTE: Integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number (This refers only to the numbers: the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

D2	442-708	1	LM317T integrated circuit	IC1
D2	442-709	1	LM337T integrated circuit	IC2

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

### HARDWARE

E1	250-52	4	4-40 $\times$ 1/4" screw	
E2	252-15	4	4-40 nut	
E3	254-9	4	#4 lockwasher	
E4	250-56	18	6-32 $\times$ 1/4" screw	
E5	250-89	2	6-32 $\times$ 3/8" screw	
E6	250-162	6	6-32 $\times$ 1/2" screw	
E7	252-3	8	6-32 nut	
E8	252-195	6	6-32 self-retaining nut	
E9	254-1	7	#6 lockwasher	
E10	259-1	1	#6 solder lug	
E11	253-45	2	#8 flat washer	
E12	253-89	1	"D" washer	
E13	207-4	1	Cable clamp	

### MISCELLANEOUS

F1	60-2	5	Slide switch	
F2	60-54	1	Slide switch 120/240	SW1
	85-2576-1	1	Circuit board	
	89-54	1	Line cord	
F3	92-665	1	Case consisting of:	
		1	92-663 case top	
		1	92-664 case bottom	
		5	92-669 mounting plate	
F4	204-2290	1	Chassis	
	347-54	15	Cable	
	406-664	1	Magnifier	



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

**Miscellaneous (cont'd.)**

G1	432-72	15	Male connector pin	
G2	432-73	15	Female connector pin	
G3	432-720	5	Connector shell with ears	
G4	432-723	5	Connector shell	
G5	431-83	1	Terminal strip	
G6	421-27	1	1/16A fuse 3AG slow-blow	F1
G7	422-1	1	Fuseholder	
			Solder	

**PRINTED MATERIAL**

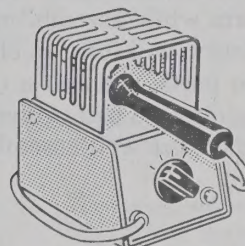
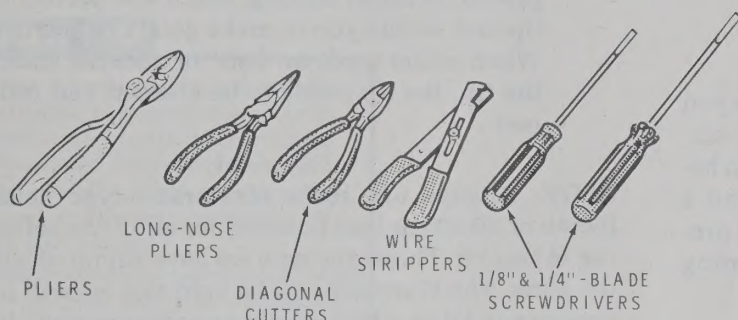
	390-341	1	Heathkit label
	390-1255	1	Fuse label
	390-1383	1	Power information label
G8	391-34	1	Blue and white label
	597-260	1	Parts Order Form
		1	Assembly Manual (See Page 1 for part number.)



## ASSEMBLY NOTES

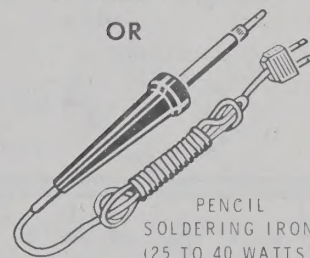
### TOOLS

You will need these tools to assemble your kit.



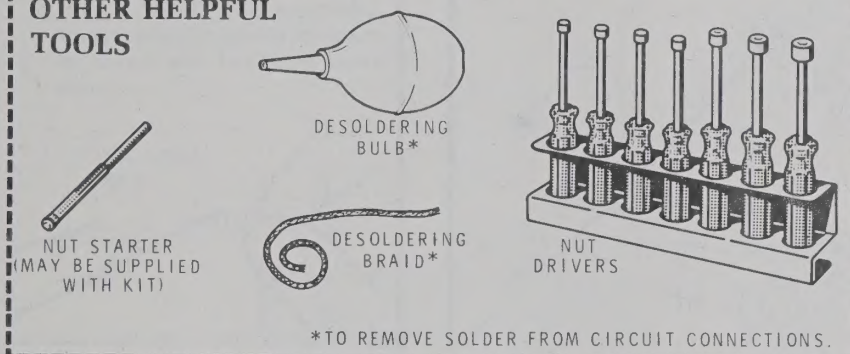
HEATHKIT  
SOLDERING  
IRON

OR



PENCIL  
SOLDERING IRON  
(25 TO 40 WATTS)

### OTHER HELPFUL TOOLS



### ASSEMBLY

- Follow the instructions carefully and read the entire step before you perform the operation.
- The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.
- Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials; Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.
- Position all parts as shown in the Pictorials.
- Solder a part or a group of parts only when you are instructed to do so.

6. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

**SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.**

## SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

It is easy to make a good solder connection if you follow a few simple rules:

1. Use the right type of soldering iron. A 25 to 40-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

**NOTE:** Always use rosin core, radio-type solder (60:40 or 50:50 tin-lead content) for all of the soldering in this kit. This is the type we have supplied with the parts. The Warranty will be void and we will not service any kit in which acid core solder or paste has been used.



# STEP-BY-STEP ASSEMBLY

## CIRCUIT BOARD ASSEMBLY

### START

In the following steps, you will be given detailed instructions on how to install and solder the first part on the circuit board. Read and perform each step carefully. Then use the same procedure whenever you install parts on a circuit board.

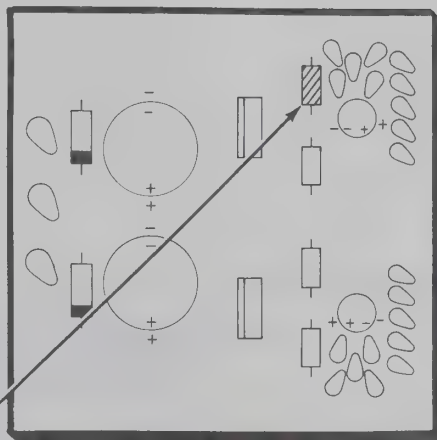
- ( ) Position the circuit board as shown with the printed side (not the foil side) up.

- ( ) Hold a 237  $\Omega$  (red-org-viol-blk), 1% precision resistor by the body as shown and bend the leads down.



- ( ) R4: Push the resistor leads through the holes at the indicated location on the circuit board. The resistor may be positioned either way.

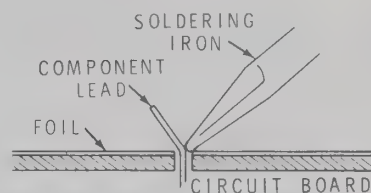
- ( ) Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



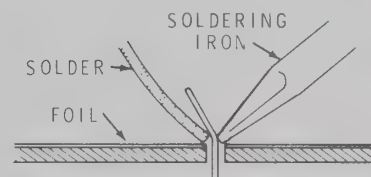
### CONTINUE

- ( ) Solder the resistor leads to the circuit board as follows:

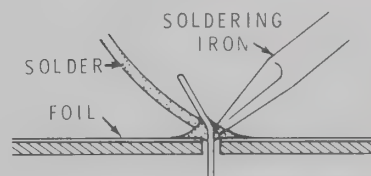
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.



2. Then apply solder to the other side of the connection. **IMPORTANT:** Let the heated lead and the circuit board foil melt the solder.



3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.

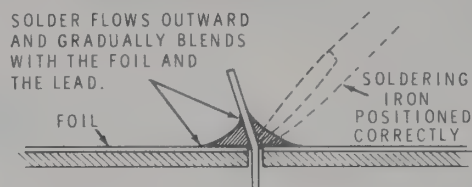


- ( ) Cut off the excess lead lengths close to the connection. **WARNING:** Clip the leads so the ends will not fly toward your eyes.

- ( ) Check each connection. Compare it to the illustrations on Page 8. After you have checked the solder connections, proceed with the assembly on Page 9. Use the same soldering procedure for each connection.

PICTORIAL 1

## A GOOD SOLDER CONNECTION



When you heat the lead and the circuit board foil at the same time, the solder will flow evenly onto the lead and the foil. The solder will make a good electrical connection between the lead and the foil.

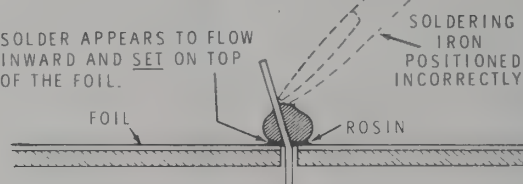
## POOR SOLDER CONNECTIONS

SOLDER DOES NOT FLOW ONTO LEAD. A DARK ROSIN BEAD SURROUNDS AND INSULATES THE LEAD FROM THE CONNECTION.



When the lead is not heated sufficiently, the solder will not flow onto the lead as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

SOLDER APPEARS TO FLOW INWARD AND SET ON TOP OF THE FOIL.



When the foil is not heated sufficiently the solder will blob on the circuit board as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

## SOLDER BRIDGES

A solder bridge between two adjacent foils is shown in photograph A. Photograph B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is; always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together. NOTE: It is alright for solder to bridge two connections on the same foil.

Use only enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil-side-down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. NOTE: The foil side of each circuit board has a coating on it called "solder resist." This is a protective insulation to help prevent solder bridges.



**A**

**SOLDER BRIDGE**

**B**

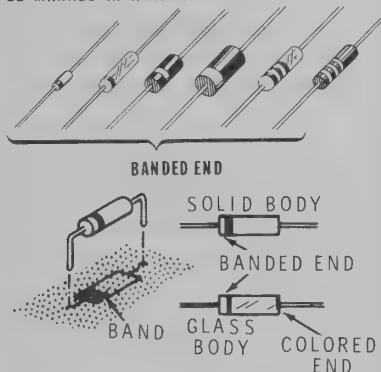




# START

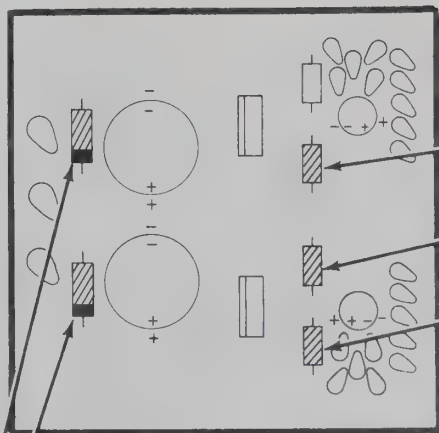
NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board. THE CIRCUIT WILL NOT WORK IF THE DIODE IS INSTALLED BACKWARDS.

IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.



( ☒ ) D2: 1N4002 diode (#57-65).

( ☐ ) D1: 1N4002 diode (#57-65).



PICTORIAL 2

# CONTINUE

( ☒ ) R3: 1470  $\Omega$  (brn-yel-viol-brn) 1% precision resistor.

( ☒ ) R2: 1470  $\Omega$  (brn-yel-viol-brn) 1% precision resistor.

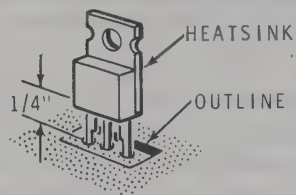
( ☒ ) R1: 237  $\Omega$  (red-org-viol-blk) 1% precision resistor.

( ☒ ) Solder the leads to the foil and cut off the excess lead lengths.

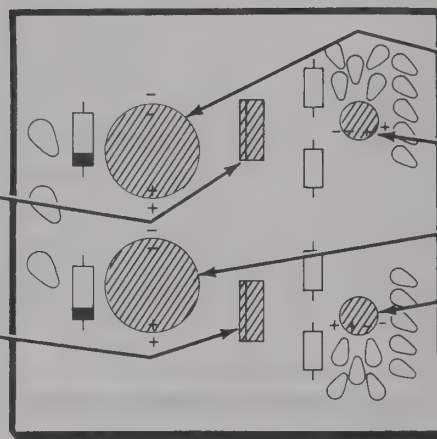
## START

( ) IC2: LM337T IC voltage regulator (#442-709). Install the regulator as follows:

1. Position the transistor so the metal tab is toward the wide line of the circuit board outline.
2. Insert the transistor leads in holes ADJUST, IN, and OUT.
3. Position the transistor approximately  $1/4"$  above the board. Solder the leads to the foil and cut off the excess lead lengths.



( ) IC1: LM317T IC voltage regulator (#442-708). Install this regulator in the same manner as the one above.

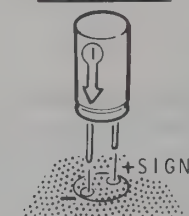


PICTORIAL 3

## CONTINUE

CAUTION: Before you install an electrolytic capacitor, note the polarity (+ or -) of the identified lead. Be sure you always connect the positive (+) lead to the positive (+) marked point on the circuit board.

IDENTIFIED  
LEAD IS  
NEGATIVE (-)



IDENTIFIED  
LEAD IS  
POSITIVE (+)



(✓) C2: 470  $\mu$ F electrolytic capacitor.

(✓) C4: 10  $\mu$ F electrolytic capacitor.

(✓) C1: 470  $\mu$ F electrolytic capacitor.

( ) C3: 10  $\mu$ F electrolytic capacitor.

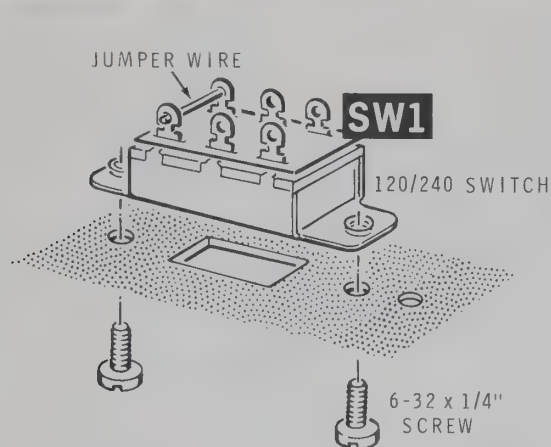
( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) Inspect the circuit board and be sure the following markings match the circuit board screen.

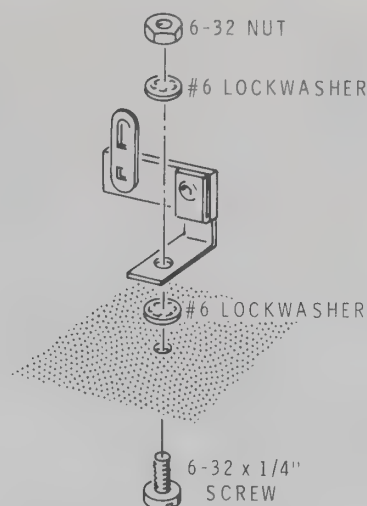
1. Diode band.
2. IC index.
3. Capacitor positive (+).

( ) Set the circuit board aside until it is called for in a step.





Detail 4A



Detail 4C

## CHASSIS ASSEMBLY

Refer to Pictorial 4 (Illustration Booklet, Page 2) for the following steps.

**NOTE:** When hardware is used, the steps will give the screw size and type only. For example, "use 6-32  $\times$  1/4" hardware" means to use a 6-32  $\times$  1/4" screw, one or more #6 lockwashers, and a 6-32 nut. Refer to the Detail for the proper installation of the hardware.

Use 6-32  $\times$  1/4" hardware in the following steps.

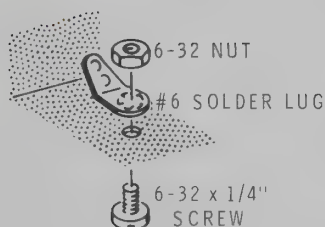
Position the chassis and the parts as shown in the Pictorial.

(☒) SW1: Refer to Detail 4A and mount the 120/240 slide switch at A.

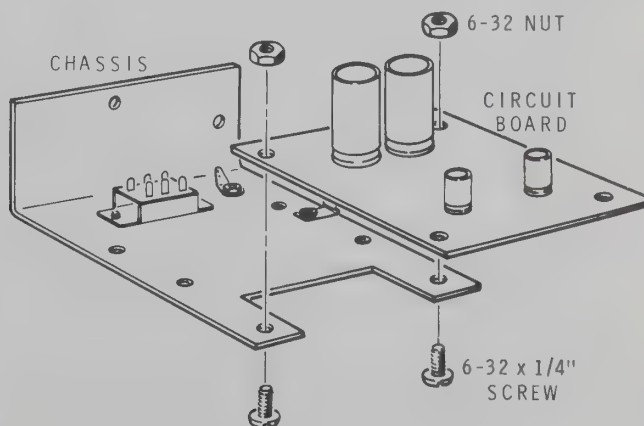
(☒) Refer to Detail 4B and mount a solder lug at B.

(☒) Refer to Detail 4C and mount a terminal strip at C.

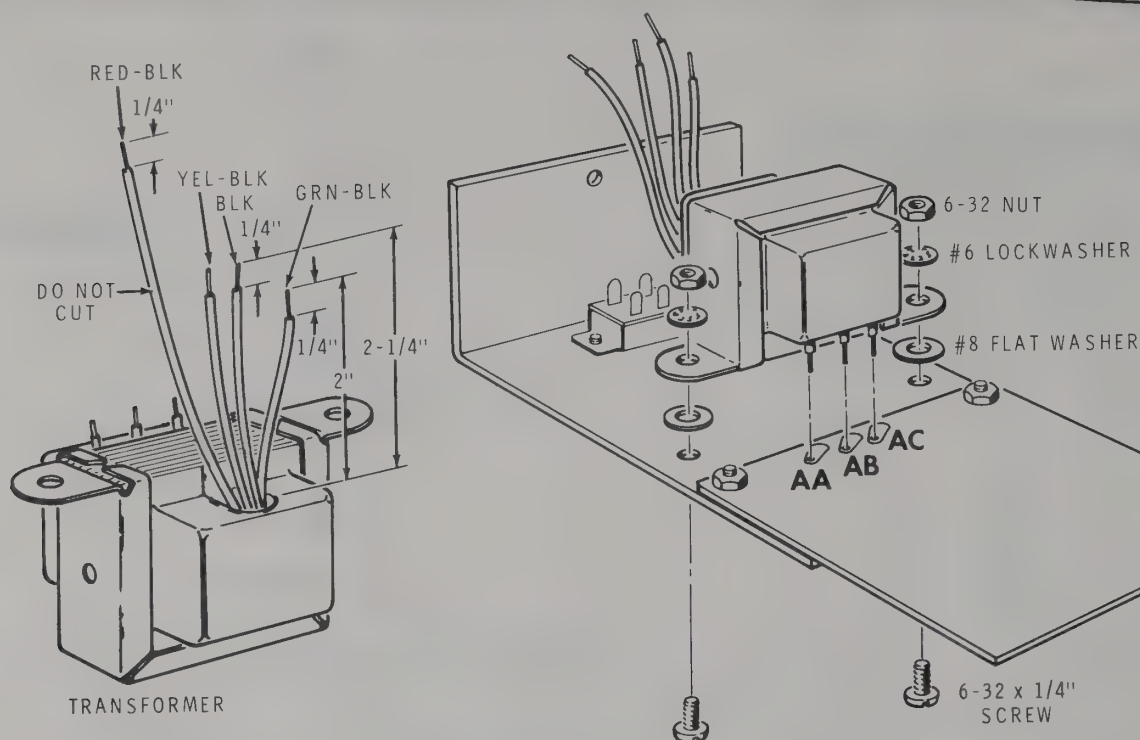
(☐) Refer to Detail 4D and mount the circuit board at D. This is a temporary mounting.



Detail 4B



Detail 4D



Detail 4E

NOTE: When wiring this kit, you will be instructed to prepare wire ahead of time, as in the following step. To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. When stranded wire is used, melt a small amount of solder on the bare wire ends to hold the small wire strands together.

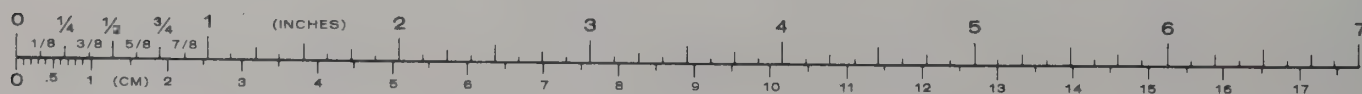
- ( ) Refer to Detail 4E and prepare the transformer leads as shown. Cut the leads to length and remove 1/4" insulation from the ends. Save the cutoff leads for use later.
- ( ) Insert the short transformer leads into their respective holes in the circuit board and mount the transformer at E. Use #8 flat washers as shown.
- ( ) Solder the transformer leads to the circuit board foil and cut off the excess lead lengths.

NOTE: In the following steps, (NS) means not to solder the connection because other wires will be added later. "S-" with a number, such as (S-3), means to solder the connection. The number following the "S" tells how many wires are at the connection. Use spe-

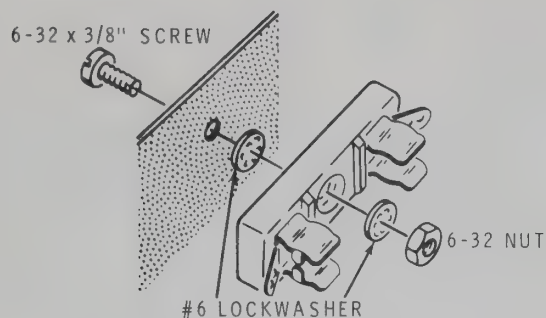
cial care when you solder these connections. Apply enough heat and solder so that all strands of each wire are properly soldered.

Refer to the inset drawing (Pictorial 4) and make mechanically secure connections as you wire the following steps.

- ( / ) Connect the green-black transformer lead to SW1 lug 2 (S-1).
- ( / ) Connect the yellow-black transformer lead to SW1 lug 5 (S-1).
- ( / ) Connect the black transformer lead to terminal strip C lug (NS).
- ( / ) Prepare a 1-3/4" black cutoff lead.
- ( / ) Connect the black cutoff lead between SW1 lug 1 (S-1) and terminal strip C lug (NS).
- ( / ) Prepare a 2" green-black cutoff lead.
- ( / ) Connect the green-black cutoff lead to SW1 lug 4 (S-1). The other end will be connected later.







Detail 4F

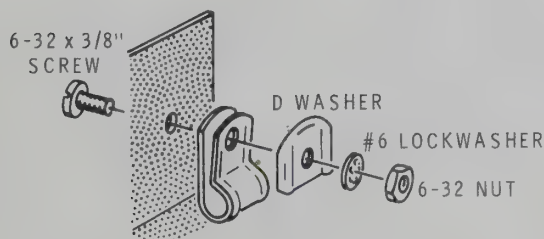
- ( ) Refer to Detail 4F and mount a fuseholder at F. Use a 6-32  $\times$  3/8" screw, two #6 lockwashers, and a 6-32 nut.
- ( ) Connect the red-black transformer lead to fuseholder lug 2 (NS).
- ( ) Connect the green-black lead coming from SW1 lug 4 to fuseholder lug 2 (S-2).

NOTE: When stranded wire is used, melt a small amount of solder on the bare wire ends to hold the small wire strands together.

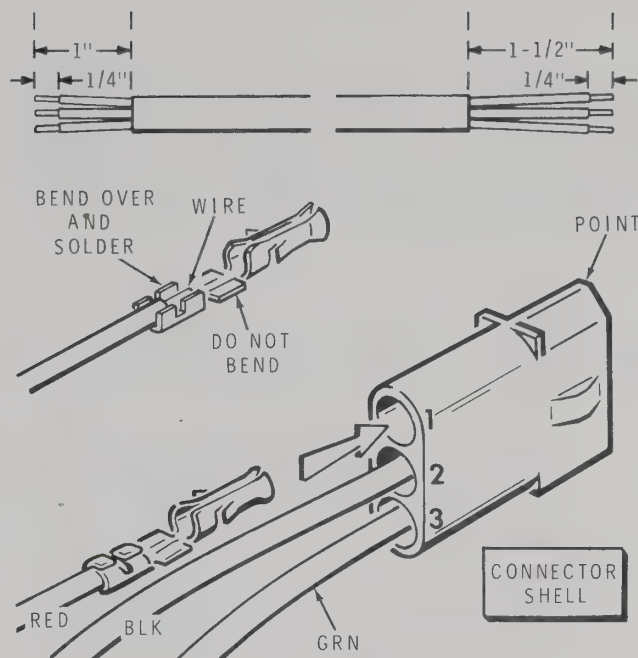
- ( ) Prepare the ends of the line cord.

Connect the line cord wires as follows:

- ( ) Green to solder lug B (S-1).
- ( ) White to terminal strip C lug (S-3).
- ( ) Black to fuseholder lug 1 (S-1).
- ( ) Refer to Detail 4G and mount a cable clamp on the line cord at G. Use 6-32  $\times$  3/8" hardware. Make sure the outer insulation is secured in the clamp.



Detail 4G



Detail 4H

Refer to Detail 4H for the following four steps.

NOTE: Mechanically secure connections are not necessary in the following steps.

1. ( ) Cut five 3' cables. Then remove 1" of outer insulation from one end of each cable and 1-1/2" of outer insulation from the other end of each cable.
2. ( ) Remove 1/4" of insulation from the ends of all wires.
3. ( ) Install a female connector pin on each wire at the 1" end of each cable.

NOTE: In the next step, the connector pins will "click" as they lock into place.

4. ( ) For each cable, insert the connector pins into a connector shell as follows:

Red wire into hole #1 (pointed end).

Black wire into hole #2.

Green wire into hole #3.

- ( ) Gently pull on the wires that you just installed. If the pins pull out of the connector shell, push them back in until they "lock" in place.

Refer to Detail 4J for the next five steps.

At the free end of each cable, solder the wires to the circuit board foil in the following steps. Cut off the excess lengths as you install them.

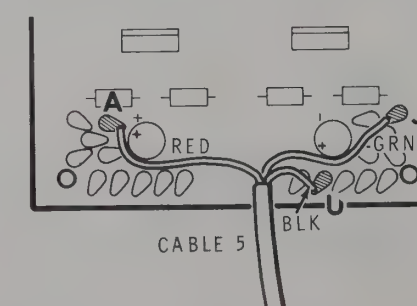
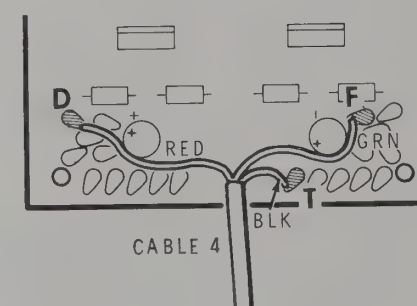
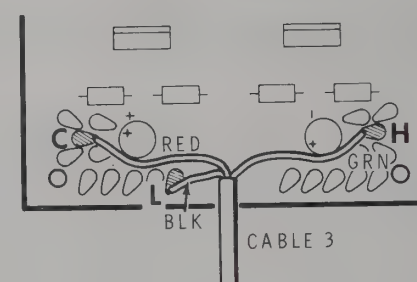
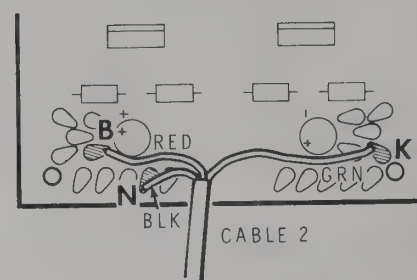
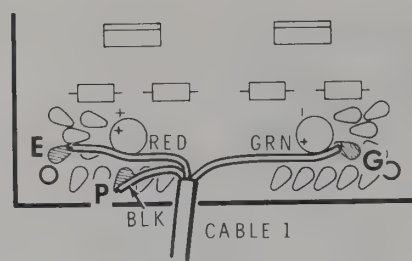
#### CABLE

- ( ✓ ) 1 Red wire to E, green wire to G, black wire to P.
- ( / ) 2 Red wire to B, green wire to K, black wire to N.
- ( / ) 3 Red wire to C, green wire to H, black wire to L.
- ( / ) 4 Red wire to D, green wire to F, black wire to T.
- ( ) 5 Red wire to A, green wire to J, black wire to U.

NOTE: Holes R, S, X, Y and Z are not used in this application.

- ( / ) Locate the fuse label and write "1/16A 3AG slow-blow" on the line provided.
- ( / ) Carefully peel the paper backing from the label and press the label on the transformer as shown.
- ( ) F1: Install the fuse in the fuseholder.

This completes the Step-by-Step Assembly of your Power Supply. Proceed to the "Initial Test" section.



Detail 4J



## INITIAL TESTS

Make the following resistance checks before you plug the line cord into an AC outlet. If you do not have a volt ohmmeter proceed to the "Final Assembly" section. The resistance readings shown below were taken with a battery-operated Heathkit Model IM-5284 Portable Multimeter. If you do not obtain the proper results, refer to the "In Case of Difficulty" section (Page 28) and correct the problem before you proceed.

Refer to Pictorial 5 (Illustration Booklet, Page 2) for the following steps.

### RESISTANCE CHECKS

- ( ) Set switch SW1 (line voltage switch) to the correct voltage (120 or 240) for your area.
- ( ) Set the meter FUNCTION switch to the OHMS position, and be sure the meter is on.

Connect the meter leads as follows and note the results in the proper column. They should equal or be greater than the values indicated.

Set the RANGE switch in the position indicated.

BLACK LEAD (—)	RED LEAD (+)	RANGE	SW1	
			120	240
( ) Line cord plug — lug 1	Line cord plug — lug 2	R x100	100	500
( ) Line cord plug — lug 3	Line cord plug — lug 2	R x100	∞	∞
( ) Line cord plug — lug 3	Any output connector — pin 2	R x100	0	0
( ) Line cord plug — lug 3	Any output connector — pin 1	R x10k	1.7k	1.7k
( ) Line cord plug — lug 3	Any output connector — pin 3	R x10k	1.7k	1.7k

This completes the resistance checks.

## VOLTAGE CHECKS

**WARNING:** When the line cord is connected to an AC outlet, AC voltage is present at several places on the chassis, as shown in Pictorial 5. Be careful you do not contact this voltage because an electrical shock can result.

- ( ) Be sure the 120/240 switch indicates the correct voltage for your area.
- ( ) Set the meter FUNCTION switch to +DC.
- ( ) Set the meter RANGE switch to the 1000-volt range; then, as you make measurements in the following steps, turn it to the 10-volt range when the voltage is lower than 10 volts.
- ( ) Plug the line cord into your outlet and be sure the meter is on.

- ( ) Connect the black meter lead to the circuit board outside (ground) foil.
- ( ) Connect the red meter lead to the output connector pin indicated and note the result.

Pin #      Result

( )          2          0-volts

( )          1          8.2 to 9.8-volts

( ) Switch the FUNCTION switch to -DC.

( )          3          8.2 to 9.8-volts

( ) Unplug the line cord and remove the meter leads.

This completes the voltage checks.

## FINAL ASSEMBLY

Refer to Pictorial 6 (Illustration Booklet, Page 3) for the following steps.

- ( ) Refer to Detail 6A and position the case top as shown.
- ( ) Install six self-retaining nuts in the case top at U, V, W, X, Y, and Z. Insert the slotted end of the nut into the hole and press in until the top of the nut is flush with the top of the post.

Set the case top aside temporarily.

- ( ) Remove and discard the circuit board mounting hardware and place the Power Supply on the case bottom and align the holes. Position the cables around the baffles and out each individual groove.
- ( ) Install six 6-32  $\times$  1/2" screws through the case bottom and into the case top. Note the screws at W and X go through the chassis and the circuit board. Tighten the screws securely.
- ( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label on the rear of the case. Be sure to refer

to the numbers on this label in any communications you have with the Heath Company about this kit.

- ( ) Carefully peel away the backing paper from the Power information label and press it into place on the case as shown.
- ( ) Carefully peel away the backing paper from the Heathkit label and press it into place on the case as shown.

This completes the assembly of the Power Supply. If you intend to modify one or more of the 5280 Series instruments to operate with your Power Supply, proceed to "Instrument Modifications". Otherwise, disregard that section of the Manual. The following parts, left over from your Power Supply parts pack, will be used to convert your instruments.

- 10 6-32  $\times$  1/4" screws
- 5 Switches
- 1 2.9 mH choke
- 5 Connector shells with ears
- 15 Male connector pins
- 5 Mounting plates.



## INSTRUMENT MODIFICATIONS

This section of the Manual will instruct you on how to convert the 5280 series instruments from battery only operation to operation with the Heath IPA-5280-1 Power Supply. Refer to the section that pertains to your particular unit or units.

### MULTIMETER

- ( ) Remove the five screws which hold the cabinet halves together and remove the cabinet top.
- ( ) Unsnap connectors from batteries.
- ( ) Remove the "C" cell from the battery compartment in the cabinet bottom.
- ( ) Remove the two battery clips from the "C" cell compartment.
- ( ) Remove the mounting plate from the rear of the cabinet bottom and discard it.
- ( ) Remove the Multimeter from the cabinet bottom. Set the cabinet and screws aside.

Refer to Pictorial 7 (Illustration Booklet, Page 4) for the following steps.

- ( ) Unsolder the red battery connector wire from SW1 wafer C lug 1.
- ( ) Unsolder the black battery connector wire from SW1 wafer C lug 7.
- ( ) Prepare the end on both battery connector wires. NOTE: If the wires are not pretinned, twist the wire strands tightly together and apply a small amount of solder to hold the strands together.
- ( ) Set the unit aside temporarily.

Refer to Pictorial 8 (Illustration Booklet, Page 4) for the following steps.

- ( ) Locate the following parts from the Power Supply parts packs:
  - 1 Slide switch (#60-2)
  - 1 Mounting plate (#92-669).
  - 3 Male connector pins (#432-72).
  - 1 Connector shell with ears (#432-720).
  - 2 6-32  $\times$  1/4" screw (#250-56).

- ( ) Prepare the following wires:

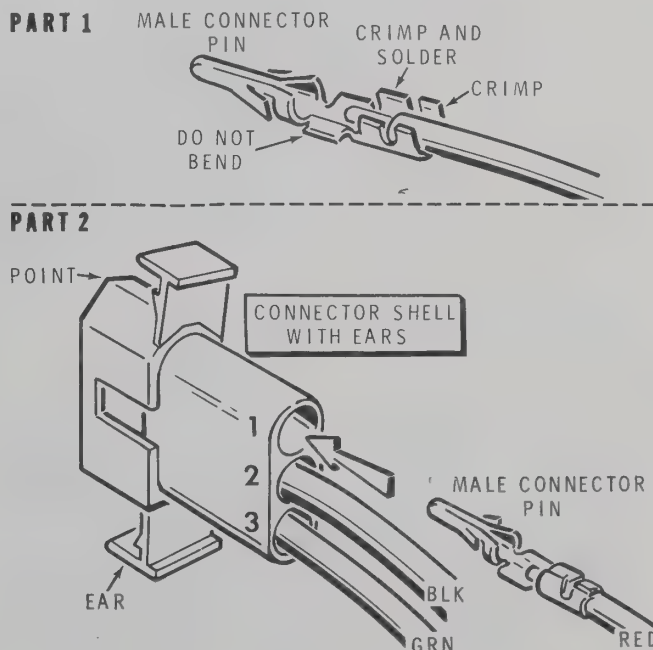
2-1/2" red  
5" black  
2-1/2" green

Refer to Detail 8-1A Part 1 and install a male connector pin on each of the following wires:

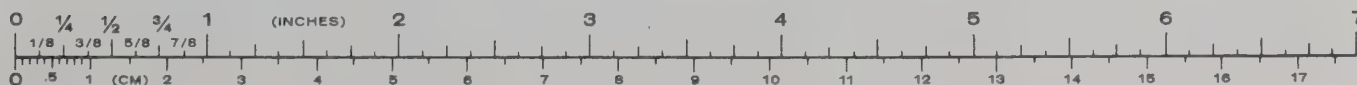
- ( ) 2-1/2" red (S-1).
- ( ) 5" black (S-1).
- ( ) 2-1/2" green (S-1).

Refer to Detail 8-1A Part 2 and position the connector shell with ears with the point as shown. Then push the male connector pins into the hole as follows. NOTE: The connector pins will click as they lock into place.

- ( ) Red wire to hole 1.
- ( ) Black wire to hole 2.
- ( ) Green wire to hole 3.



Detail 8-1A



Connect the free ends of the wires coming from plug P1 as follows:

- ( ) Red wire to SW3 lug 3 (S-1).
- ( ) Black wire to circuit board hole C (S-1).
- ( ) Green wire to SW3 lug 6 (S-1).
- ( ) Prepare the following wires:

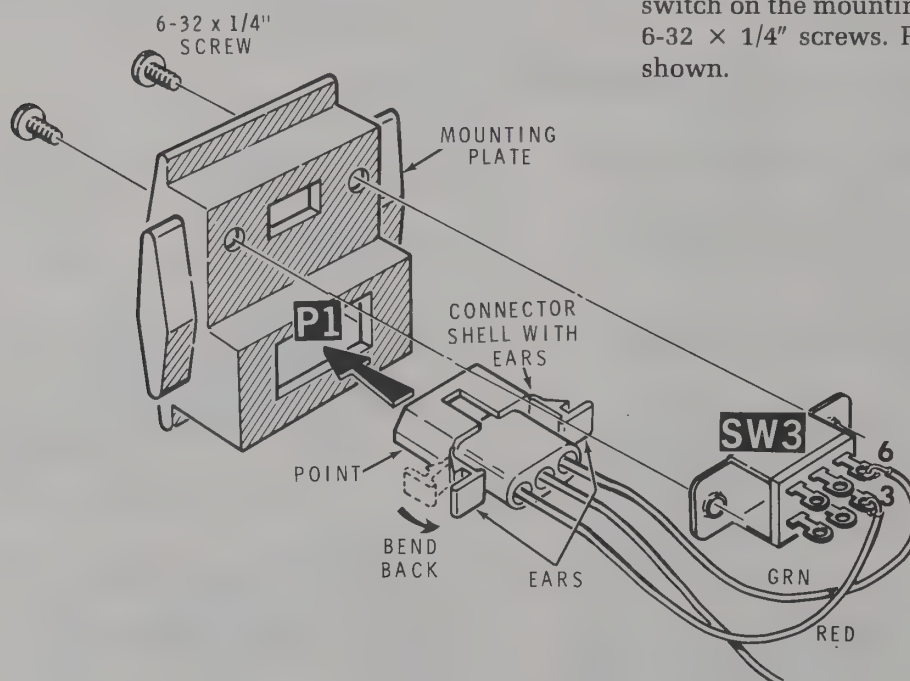
6" red  
6" green

Connect one end of each prepared wire to SW1 wafer C as follows:

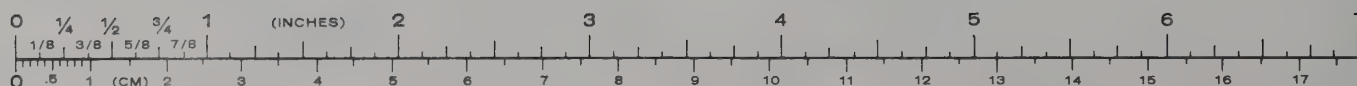
- ( ) Red wire to lug 1 (S-1).
- ( ) Green wire to lug 7 (S-1).

Connect the other end of the 6" red and 6" green wires to SW3 as follows:

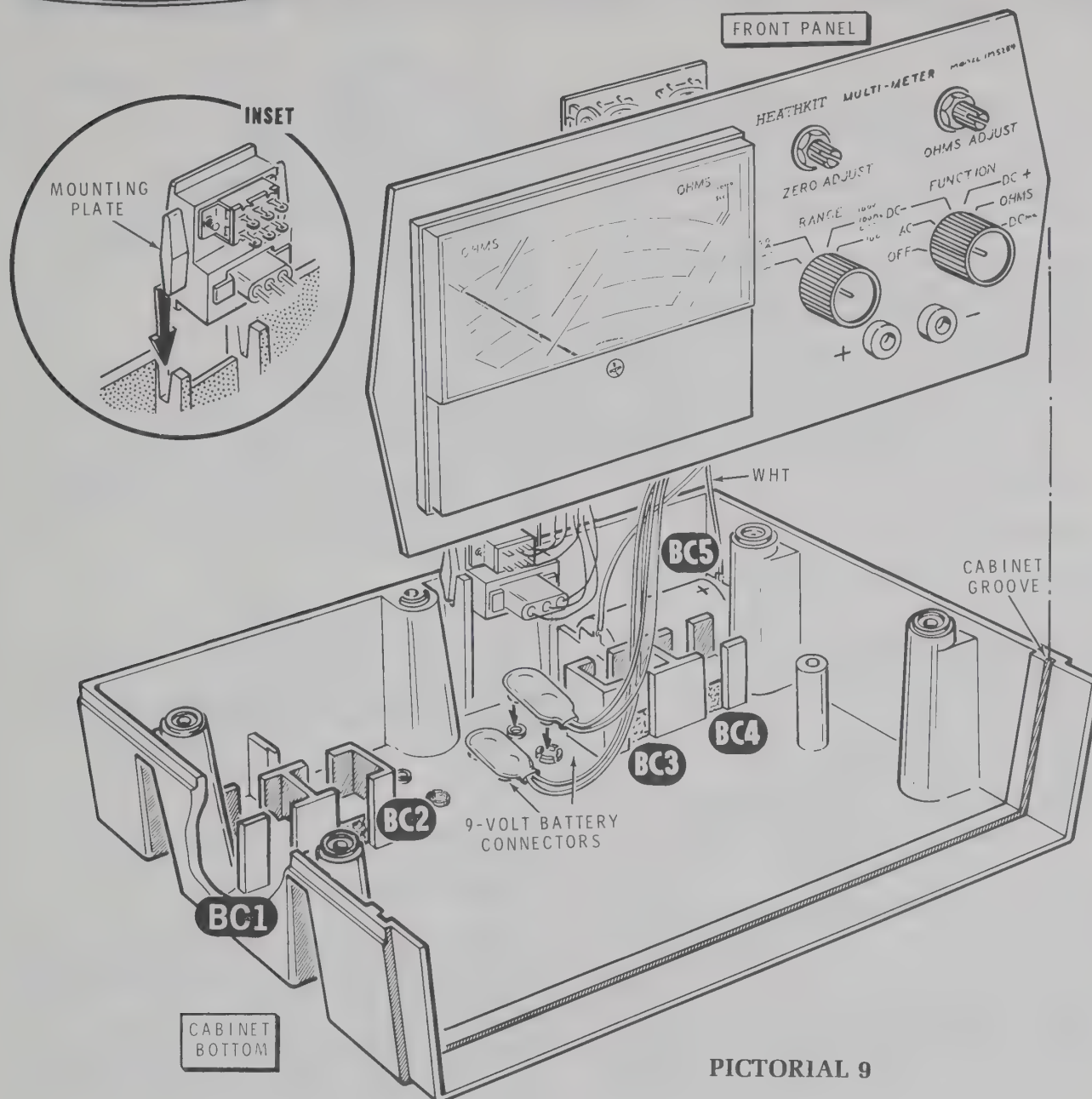
- ( ) Red wire to lug 2 (S-1).
- ( ) Green wire to lug 5 (S-1).
- ( ) Connect the prepared end of the red battery connector wire to SW3 lug 1 (S-1).
- ( ) Connect the black battery connector wire to SW3 lug 4 (S-1).
- ( ) P1: Refer to Detail 8-1B and bend the ears of the connector shell back against the side of the body. Position the pointed end as shown. Push the connector shell into the mounting plate hole at P1. The ears will lock into place at the edge of the hole.
- ( ) SW3: Refer to Detail 8-1B and install the slide switch on the mounting plate at SW3 with two 6-32 × 1/4" screws. Position lugs 3 and 6 as shown.



Detail 8-1B







PICTORIAL 9

Refer to Pictorial 9 for the following steps.

- ( ) Install the Multimeter in the cabinet bottom.
- ( ) Install the two battery clips in compartment BC5 and reinstall the "C" cell. Be sure the clips and the white wire are positioned as shown.
- ( ) Install the mounting plate in the rear opening of the cabinet bottom as shown in the inset drawing.
- ( ) If you intend to use batteries, install them in compartments BC1 and BC2. If you do not intend to use batteries, press the battery connectors onto the battery connector storage clips in the cabinet bottom as shown.
- ( ) Install the cabinet top on the cabinet bottom and secure the assembly with the five screws you removed earlier.

NOTE: If you intend to operate the Multimeter with the Power Supply at this time, insert one of the five male connector shells coming from the power supply into the female connector shell on the rear mounting plate of your Multimeter. Then place the slide switch on the rear mounting plate in the LINE position. If you intend to operate with batteries, place the slide switch in the BATT position.

This completes the "Multimeter" modifications.

## RF OSCILLATOR

- ( ) Remove the five screws which hold the cabinet halves together and remove the cabinet top.
- ( ) Remove the mounting plate from the rear of the cabinet bottom and discard it.
- ( ) Remove the two screws which hold the RF oscillator to the cabinet bottom and remove the Oscillator from the cabinet. Set the cabinet and screws aside.

Refer to Pictorial 10 (Illustration Booklet, Page 5) for the following steps.

- ( ) Unsolder the red wires at circuit board holes AA and AD.
- ( ) Set the unit aside temporarily.

Refer to Pictorial 11 (Illustration Booklet, Page 5) for the following steps.

- ( ) Locate the following parts from the Power Supply parts pack:

- 1 Slide switch (#60-2).
- 1 Mounting plate (#92-669).
- 2 Male connector pins (#432-72).
- 1 Connector shell with ears (#432-720).
- 1 2.9 mH choke (#45-81).
- 2 6-32  $\times$  1/4" screws (#250-56).

- ( ) Prepare the following wires:

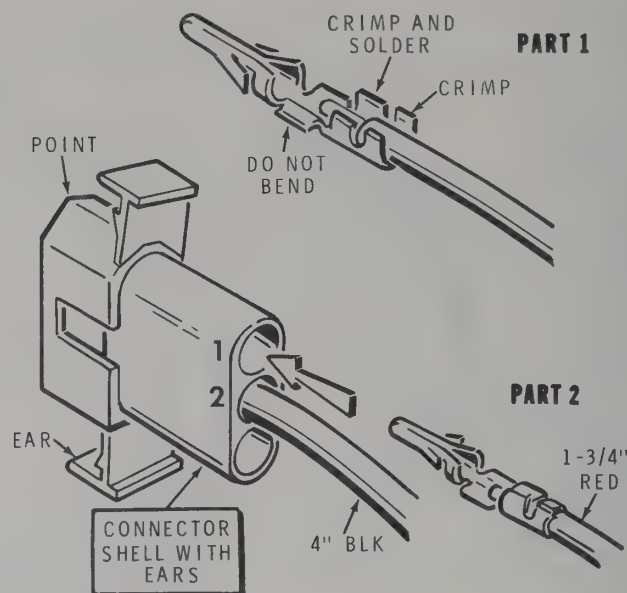
- 1-3/4" red
- 4" black

Refer to Detail 11-1A Part 1 and install a male connector pin on each of the following wires:

- ( ) 1-3/4" red (S-1).
- ( ) 4" black (S-1).

Refer to Detail 11-1A Part 2 and position the connector shell with ears with the point as shown. Then push the male connector pins into the holes as follows. The connector pins will click as they lock into place. NOTE: Hole 3 of the connector will not be used.

- ( ) Red wire to hole 1.
- ( ) Black wire to hole 2.

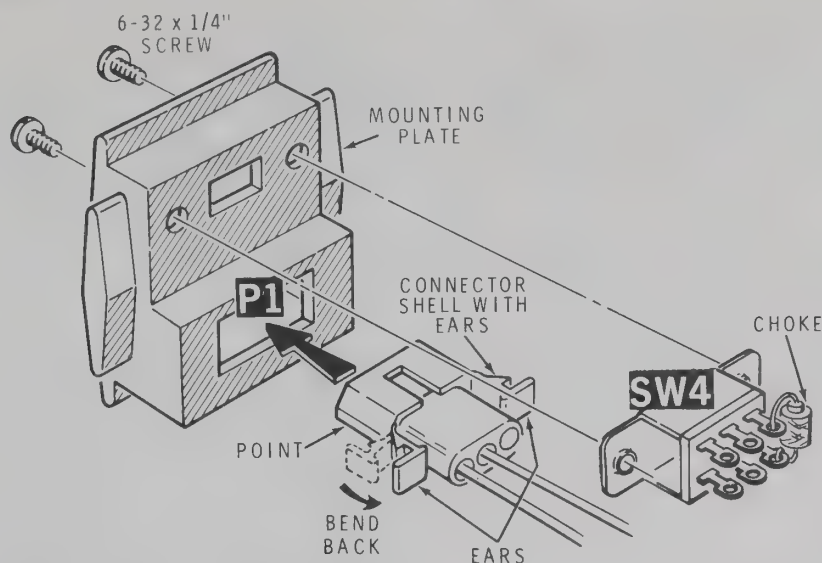


**Detail 11-1A**

Connect the free end of the wires coming from plug P1 as follows:

- ( ) Red wire to SW4 lug 3 (NS).
- ( ) Black wire to circuit board hole X (S-1).
- ( ) Prepare two 4" red wires.
- ( ) Connect one end of either 4" red wire to SW4 lug 1 (S-1) and connect one end of the other 4" red wire to SW4 lug 4 (S-1).
- ( ) Connect the other end of the red wire coming from SW4 lug 1 to circuit board hole AD (S-1).
- ( ) Connect the free end of the remaining red wire coming from SW4 lug 4 to circuit board hole AA (S-1).
- ( ) Connect the free end of the red wire coming from SW2 lug 1 to SW4 lug 5 (S-1).
- ( ) Connect the free end of the red wire coming from SW3 lug 1 to SW4 lug 2 (S-1).
- ( ) Connect the 2.9 mH choke to SW4 between lugs 3 (S-2) and 6 (S-1).





Detail 11-1B

- ( ) P1: Refer to Detail 11-1B and bend the ears of the connector shell back against the side of the body. Position the pointed end as shown. Push the connector shell into the mounting hole at P1. The ears will lock into place at the edge of the hole.
- ( ) SW4: Refer to Detail 11-1B and install the slide switch on the mounting plate at SW4 with two 6-32  $\times$  1/4" screws. Position the end with the choke as shown.

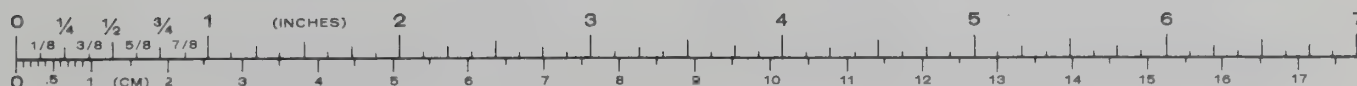
Refer to Pictorial 12 (Illustration Booklet, Page 6) for the following steps.

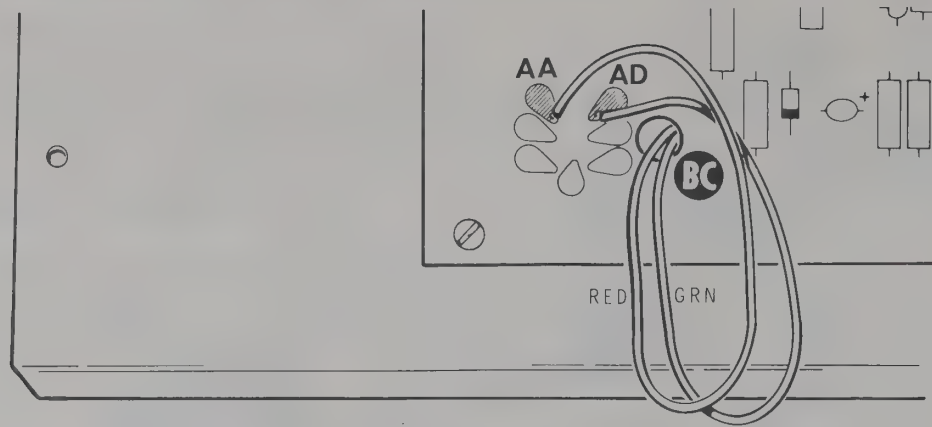
- ( ) Mount the RF oscillator in the cabinet bottom and secure it with the two screws you removed earlier.
- ( ) Install the mounting plate in the rear opening of the cabinet bottom as shown in the inset drawing.

- ( ) If you intend to use batteries, install them in compartments BC3 and BC4 as shown. If you do not intend to use batteries, press the battery connectors onto the battery connector storage clips in the cabinet bottom.
- ( ) Install the cabinet top on the cabinet bottom and secure the assembly with the five screws you removed earlier.

NOTE: If you intend to operate the RF Oscillator with your Power Supply at this time, insert one of the five male connector shells coming from the Power Supply into the female connector shell on the rear mounting plate of the RF Oscillator. Then place the slide switch on the rear mounting plate in the LINE position. If you intend to operate with batteries, place the slide switch in the BATT position.

This completes the "RF Oscillator" modifications.





PICTORIAL 13

**AUDIO GENERATOR**

- ( ) Remove the five screws which hold the cabinet halves together and remove the cabinet top.
- ( ) Remove the two screws which hold the Audio Generator to the cabinet bottom and remove the generator. Set the cabinet and screws aside.
- ( ) Remove the upper and lower shields from the chassis. Set the upper and lower shields and hardware aside.
- ( ) Remove the mounting plate from the rear of the cabinet bottom and discard it.

Refer to Pictorial 13 for the following steps.

- ( ) Unsolder the red wire from circuit board hole AA.
- ( ) Unsolder the green wire from circuit board hole AD.
- ( ) Set the unit aside temporarily.

Refer to Pictorial 14 (Illustration Booklet, Page 6) for the following steps.

- ( ) Locate the following parts from your power supply parts pack:
  - 1 Slide switch (#60-2).
  - 1 Mounting plate (#92-669).
  - 3 Male connector pins (#432-72).
  - 1 Connector shell with ears (#432-720).
  - 2 6-32  $\times$  1/4" screws (#250-56).

- ( ) Prepare the following wires:

1-3/4" red  
4" black  
1-3/4" green

Refer to Detail 14-1A Part 1 and install a male connector pin on each of the following wires:

- ( ) 1-3/4" red (S-1).
- ( ) 4" black (S-1).
- ( ) 1-3/4" green (S-1).

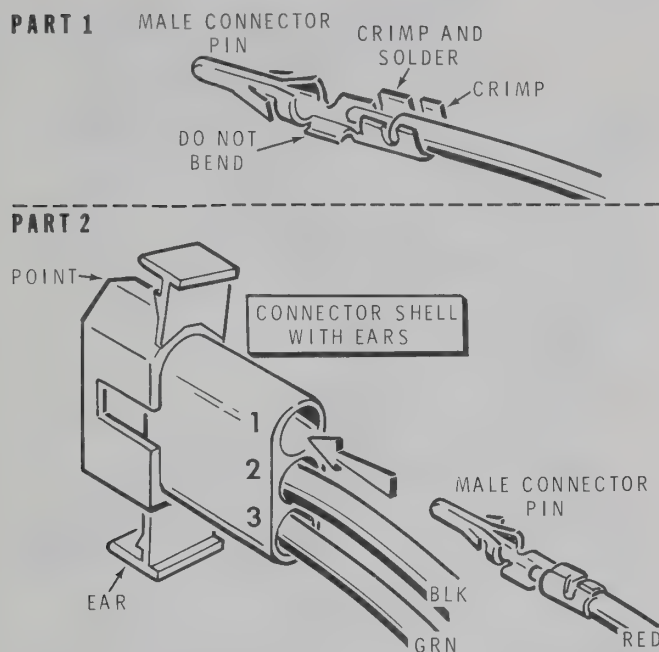
Refer to Detail 14-1A Part 2 and position the connector shell with ears with the point as shown. Then push the male connector pins into the holes as follows. NOTE: The connector pins will click as they lock into place.

- ( ) Red wire to hole 1.
- ( ) Black wire to hole 2.
- ( ) Green wire to hole 3.

Connect the free end of the wires coming from plug P1 as follows:

- ( ) Red wire to SW4 lug 3 (S-1).
- ( ) Black wire to circuit board hole Z (S-1).
- ( ) Green wire to SW4 lug 6 (S-1).





Detail 14-1A

- ( ) Prepare the following wires:

4" red  
4" green

Connect one end of each prepared wire to the circuit board as follows:

- ( ) Red wire to hole AA (S-1).
- ( ) Green wire to hole AD (S-1).

Connect the other end of the 4" red and 4" green wires to SW4 as follows:

- ( ) Red wire to lug 1 (S-1).
- ( ) Green wire to lug 4 (S-1).
- ( ) Connect the free end of the red wire coming from circuit board hole BC to SW4 lug 2 (S-1).
- ( ) Connect the green wire coming from circuit board hole BC to SW4 lug 5 (S-1).

- ( ) P1: Refer to Detail 14-1B and bend the ears of the connector shell back against the side of the body. Position the pointed end as shown. Push the connector shell into the mounting plate hole at P1. The ears will lock into place at the edge of the hole.

- ( ) SW4: Refer to Detail 14-1B and install the slide switch on the mounting plate at SW4 with two 6-32  $\times$  1/4" screws. Position lugs 3 and 6 as shown.

- ( ) Mount the lower shield to the chassis with the hardware you removed earlier.

Refer to Pictorial 15 (Illustration Booklet, Page 7) for the following steps.

- ( ) Refer to Detail 15-1 and route the wires through the grommet in the upper shield as shown. Then mount the upper shield to the chassis with the screws you removed earlier.

- ( ) Install the Audio Generator in the cabinet bottom. Slide the front panel into the cabinet groove.

- ( ) Secure the chassis with two #6  $\times$  3/8" screws (coarse thread).

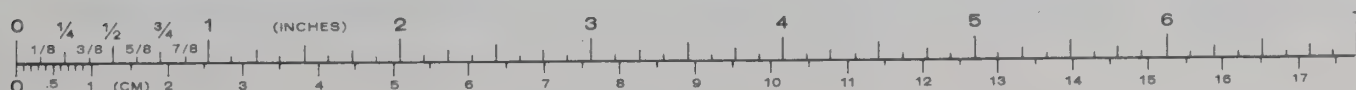
- ( ) If you intend to use batteries, install them in compartments BC3 and BC4. If you do not intend to use batteries, press the battery connectors onto the battery connector storage clips in the cabinet bottom.

- ( ) Install the mounting plate at the rear opening of the cabinet bottom as shown in the inset drawing.

- ( ) Install the cabinet top on the cabinet bottom and secure the assembly with the five screws you removed earlier.

NOTE: If you intend to operate the Audio Generator with the Power Supply at this time, insert one of the five male connector shells into the female connector shell on the rear mounting plate of the Audio Generator. Then place the slide switch on the rear mounting plate in the LINE position. If you intend to operate with batteries, place the slide switch in the BATT position.

This completes the "Audio Generator" modification.



## RLC BRIDGE

- ( ) Remove the five screws which hold the cabinet halves together and remove the cabinet top.
- ( ) Remove the mounting plate from the rear of the cabinet bottom and discard it.
- ( ) Remove the two screws which hold the RLC Bridge to the cabinet bottom and remove the bridge. Set the cabinet and screws aside.

Refer to Pictorial 16 (Illustration Booklet, Page 8) for the following steps.

- ( ) Unsolder the red wire from circuit board hole Z.
- ( ) Unsolder the green wire from circuit board hole Y.
- ( ) Set the unit aside temporarily.

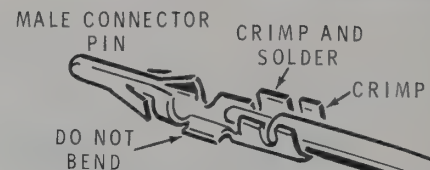
Refer to Pictorial 17 (Illustration Booklet, Page 8) for the following steps.

- ( ) Locate the following parts from your power supply parts pack:
  - 1 Slide switch (#60-2).
  - 1 Mounting plate (#92-669).
  - 3 Male connector pins (#432-72).
  - 1 Connector shell with ears (#432-720).
  - 2 6-32  $\times$  1/4" screws (#250-56).

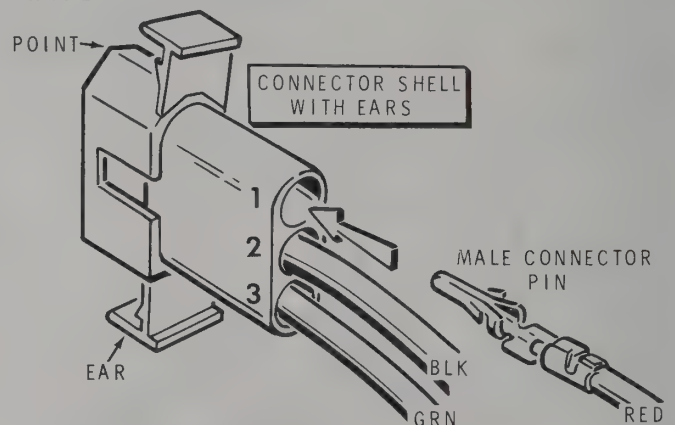
- ( ) Prepare the following wires:

1-3/4" red  
8" black  
2-1/4" green

### PART 1



### PART 2



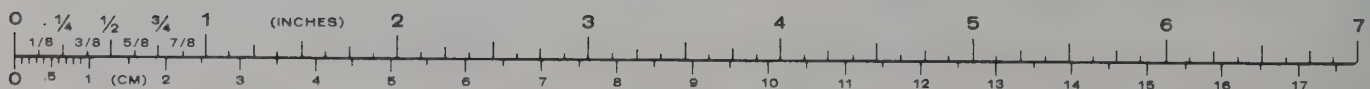
**Detail 17-1A**

Refer to Detail 17-1A Part 1 and install a male connector pin on each of the following wires:

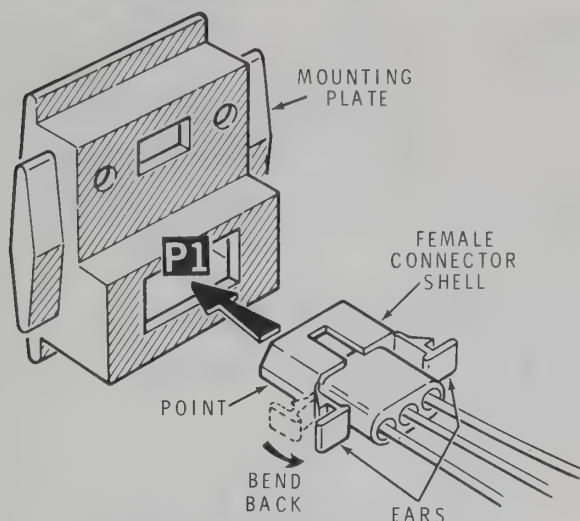
- ( ) 1-3/4" red (S-1).
- ( ) 8" black (S-1).
- ( ) 2-1/4" green (S-1).

Refer to Detail 17-1A Part 2 and position the connector shell with ears with the point as shown. Then push the male connector pins into the holes as follows. NOTE: The connector pins will click as they lock in place.

- ( ) Red wire to hole 1.
- ( ) Black wire to hole 2.
- ( ) Green wire to hole 3.





**Detail 17-1B**

- ( ) P1: Refer to Detail 17-1B and bend the ears of the connector shell back against the side of the body. Position the pointed end as shown. Push the connector shell into the mounting plate hole at P1. The ears will lock into place at the edge of the hole.
- ( ) SW3: Refer to Detail 17-1C and install the slide switch on the mounting plate at SW3 with two 6-32 × 1/4" screws.

Connect the free end of the wires coming from plug P1 as follows:

- ( ) Red wire to SW3 lug 6 (S-1).
- ( ) Black wire to circuit board hole X (S-1).
- ( ) Green wire to SW3 lug 1 (S-1).
- ( ) Prepare the following wires:

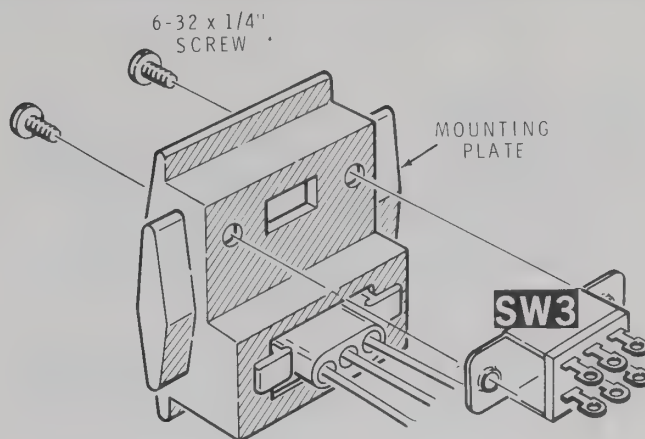
7-1/2" red  
7-1/2" green

Connect one end of each prepared wire to the circuit board as follows:

- ( ) Red wire to hole Z (S-1).
- ( ) Green wire to hole Y (S-1).

Connect the other end of the 7-1/2" red and 7-1/2" green wires to SW3 as follows:

- ( ) Red wire to lug 4 (S-1).

**Detail 17-1C**

- ( ) Green wire to lug 3 (S-1).
- ( ) Connect the free end of the red wire coming from circuit board hole F to SW3 lug 5 (S-1).
- ( ) Connect the green wire coming from circuit board hole F to SW3 lug 2 (S-1).

Refer to Pictorial 18 (Illustration Booklet, Page 9) for the following steps.

- ( ) Mount the RLC Bridge in the cabinet bottom with the screws removed earlier.
- ( ) Install the mounting plate in the rear opening of the cabinet bottom as shown in the inset drawing.
- ( ) If you intend to use batteries, install them in compartments BC1 and BC2. If you do not intend to use batteries, press the battery connectors onto the battery connector storage clips in the cabinet bottom.
- ( ) Install the cabinet top on the cabinet bottom and secure the assembly with the five screws you removed earlier.

**NOTE:** If you intend to operate the RLC Bridge with the Power Supply at this time, insert one of the five male connector shells coming from the Power Supply into the female connector shell on the rear mounting plate of the RLC Bridge. Then place the slide switch on the rear mounting plate in the LINE position. If you intend to operate with batteries, place the slide switch in the BATT position.

This completes the "RLC Bridge" modifications.

## SIGNAL TRACER

- ( ) Remove the five screws which hold the cabinet halves together and remove the cabinet top.
- ( ) Remove the mounting plate from the rear of the cabinet bottom and discard it.
- ( ) Remove the two screws which hold the Signal Tracer to the cabinet bottom and remove the tracer. Set the cabinet and screws aside.

Refer to Pictorial 19 (Illustration Booklet, Page 9) for the following steps.

- ( ) Unsolder the red wire from circuit board hole T.
- ( ) Unsolder the green wire from circuit board hole P.
- ( ) Set the unit aside temporarily.

Refer to Pictorial 20 (Illustration Booklet, Page 10) for the following steps.

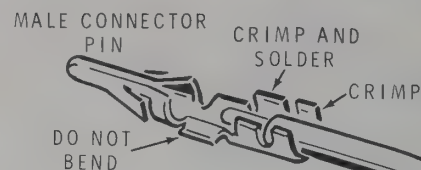
- ( ) Locate the following parts from your power supply parts pack:

- 1 Slide switch (#60-2).
- 1 Mounting plate (#92-669).
- 3 Male connector pins (#432-72).
- 1 Connector shell with ears (#432-720).
- 2 6-32  $\times$  1/4" screws (#250-56).

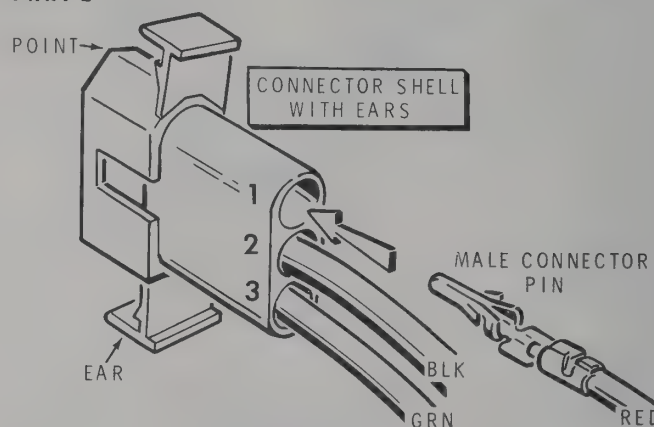
- ( ) Prepare the following wires:

1-3/4" red  
8" black  
2-1/4" green

### PART 1



### PART 2



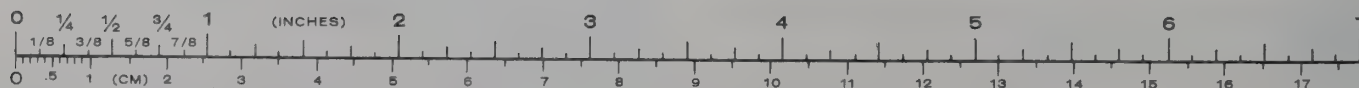
**Detail 20-1A**

Refer to Detail 20-1A Part 1 and install a male connector pin on each of the following wires:

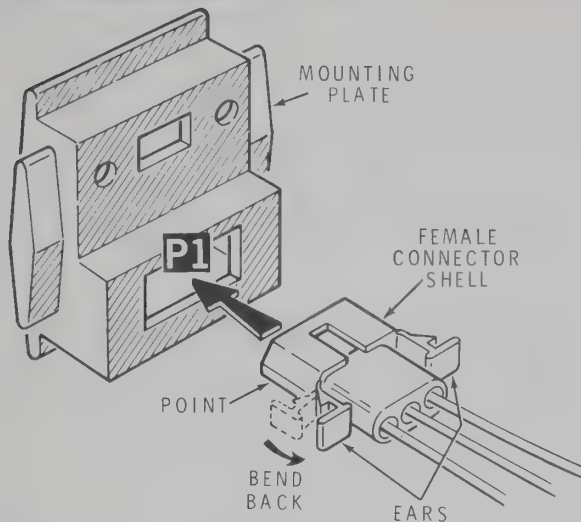
- ( ) 1-3/4" red (S-1).
- ( ) 8" black (S-1).
- ( ) 2-1/4" green (S-1).

Refer to Detail 20-1A Part 2 and position the connector shell with ears with the point as shown. Then push the male connector pins into the holes as follows. NOTE: The connector pins will click as they lock into place.

- ( ) Red wire to hole 1.
- ( ) Black wire to hole 2.
- ( ) Green wire to hole 3.



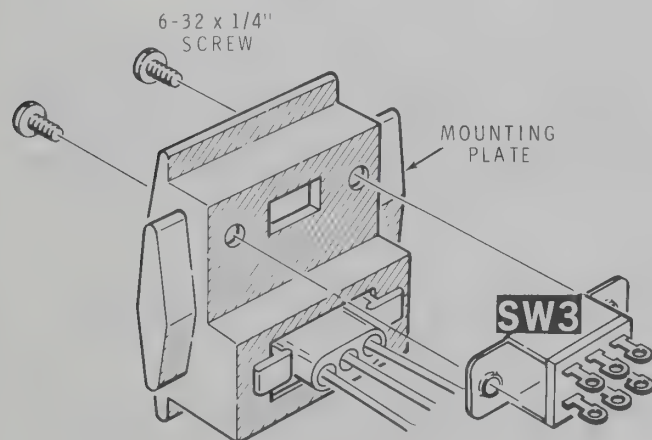


**Detail 20-1B**

- ( ) P1: Refer to Detail 20-1B and bend the ears of the connector shell back against the side of the body. Position the pointed end as shown. Push the connector shell into the mounting plate hole at P1. The ears will lock in place at the edge of the hole.
- ( ) SW3: Refer to Detail 20-1C and install the slide switch on the mounting plate at SW3 with two 6-32  $\times$  1/4" screws.

Connect the free end of the wires coming from plug P1 as follows:

- ( ) Red wire to SW3 lug 4 (S-1).
- ( ) Black wire to circuit board hole Y (S-1).
- ( ) Green wire to SW3 lug 3 (S-1).
- ( ) Twist a red and a green wire together to form a 7-1/2" twisted pair.

**Detail 20-1C**

Connect one end of the twisted red and green wires to the circuit board as follows:

- ( ) Red wire to hole T (S-1).
- ( ) Green wire to hole P (S-1).

Connect the other end of the twisted red and green wires to SW3 as follows:

- ( ) Red wire to lug 6 (S-1).
- ( ) Green wire to lug 1 (S-1).
- ( ) Connect the free end of the red wire coming from SW1 wafer 2 lug 3 to SW3 lug 5 (S-1).
- ( ) Connect the free end of the green wire coming from SW1 wafer 2 lug 1 to SW3 lug 2 (S-1).

Refer to Pictorial 21 (Illustration Booklet, Page 10) for the following steps.

- ( ) Mount the Signal Tracer in the cabinet bottom with the screws removed earlier.
- ( ) Install the mounting plate in the rear opening of the cabinet bottom as shown in the inset drawing.
- ( ) If you intend to use batteries, install them in compartments BC1 and BC2. If you do not intend to use batteries, press the battery connectors onto the battery storage clips in the cabinet bottom.
- ( ) Install the cabinet top on the cabinet bottom and secure the assembly with the five screws you removed earlier.

**NOTE:** If you intend to operate the Signal Tracer with the Power Supply at this time, insert one of the five male connector shells coming from the Power Supply into the female connector shell on the rear mounting plate of the Signal Tracer. Then place the slide switch on the rear mounting plate in the LINE position. If you intend to operate with batteries, place the slide switch in the BATT position.

This completes the "Signal Tracer" modifications.

## IN CASE OF DIFFICULTY

This part of the Manual provides you with information that will help you locate and correct difficulties which may occur in your Power Supply. This information is divided into two sections. The first section, "General," contains suggestions of a general nature in the following areas:

- Visual check and inspection.
- Precautions to observe when bench testing.

The second section, "Troubleshooting," contains a series of "Conditions" and "Possible Causes." Start your troubleshooting procedure by first reading the following "General" section. Then proceed to the appropriate "Condition" and "Possible Cause."

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.

NOTE: Refer to the "Circuit Board X-Ray View" on Page 31 for the physical location of parts. A review of the "Circuit Description" (Page 30) may also be helpful.

### GENERAL

#### Visual Checks

1. About 90% of the kits that are returned for repair do not function properly due to poor soldering. Therefore, you can eliminate many troubles by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Assembly Notes." Reheat any doubtful connections and be sure all the wires are soldered at places where several wires are connected. Check carefully for solder bridges between circuit board foils.
2. Check to be sure that IC's are in their proper locations, and are installed correctly.
3. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions.

Be sure the banded end of each diode is positioned correctly.

Check each electrolytic capacitor to be sure the lead near the positive (+) marking is at the correct position.
4. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as you check it. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
5. Check all component leads connected to the circuit board. Make sure the leads do not extend too far through the circuit board and make contact with other connections or parts.
6. Check all of the wires that are connected to the circuit board or terminal strip to be sure the wires do not touch the chassis. Make sure all wires are properly soldered.

**WARNING:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis, as shown in Pictorial 5 (Illustration Booklet, Page 2). Be careful you do not contact this voltage or an electrical shock can result.

## Precautions for Bench Testing

- Be cautious when testing integrated circuits. Although they have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage and current than other circuit components.
- Be careful so you do not short any terminals to ground when you make voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it may damage one or more components.

Do not remove any components from the circuit board while the unit is turned on.

When you make repairs, make sure you eliminate the cause as well as the effect of the trouble. If, for example, you find a damaged resistor, make sure you find out what damaged the resistor (wiring error, etc.). If the cause is not eliminated, the replacement resistor may become damaged when the unit is put back into operation.

Refer to the X-Ray View (Page 31), Identification Chart (Page 32), and the "Schematic Diagram" (Illustration Booklet, Page 11) to locate the various components.

## TROUBLESHOOTING

The following chart lists conditions and possible causes of specific malfunctions. If a particular part is mentioned (D1 for example) as a possible cause, check that part and other components connected to that part to see that they are installed and/or wired correctly. Also check for solder bridges and poor connections in the surrounding area. It is also possible, on rare occasions, for a part to be faulty and require replacement.

NOTE: The integrated circuits (regulators) have their own "shut down" system to protect the Power Supply against thermal overload, short circuits, etc. If you trace the difficulty to the regulators, disconnect the line cord, remove the load, and wait for the regulators to cool (could take several hours). Then check the voltage before you connect a load. Usually the trouble will not be in the regulator.

## Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE
Output voltage low or zero.	<ol style="list-style-type: none"> <li>1. Fuse.</li> <li>2. Diode D1, D2.</li> <li>3. Capacitor C1, C2, C3, C4.</li> <li>4. Transformer.</li> <li>5. Regulator IC's.</li> </ol>
Output voltage high, or low (but not zero).	<ol style="list-style-type: none"> <li>1. Resistor divider R1, R2, R3.</li> <li>2. Regulator IC's.</li> </ol>
Output 9V with no load; but drops with load connected.	<ol style="list-style-type: none"> <li>1. Load shorted.</li> <li>2. Regulator IC's.</li> </ol>





## SPECIFICATIONS

Output Voltage .....	+9 and -9 VDC $\pm 9\%$ .
Maximum Output Current .....	100 milliamps.
Integrated Circuit and Diode Complement .....	UA78, UA79 regulator IC. 1N4002 silicon diode.
Power Requirements .....	100 to 135 VAC or 200 to 270 VAC. 50/60 Hz, 7 watts maximum.
Dimensions .....	6" high $\times$ 3-3/4" wide $\times$ 3" deep. (15.24 $\times$ 9.52 $\times$ 7.62 cm)
Fuse .....	1/16-amp, 3AG, slow-blow primary.
Net Weight .....	1.75 lbs. (.8 kg).

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The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

## CIRCUIT DESCRIPTION

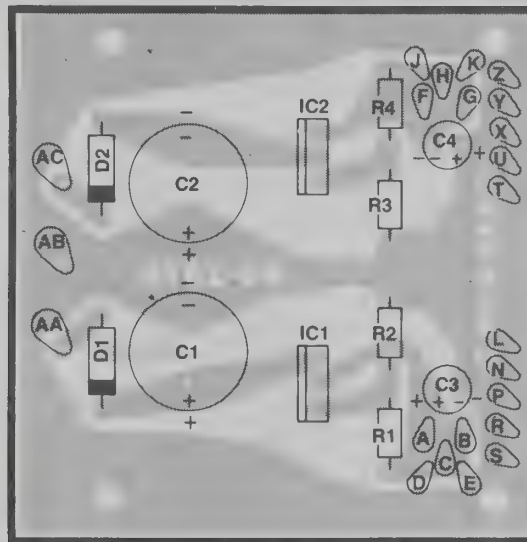
See the schematic drawing on Page 11 of the Illustration Booklet. The power supply circuit consists of a power transformer T1, diodes D1 and D2, to rectify the AC voltage, capacitors C1 and C2, to filter the rectified voltage, and two integrated circuit voltage regulators, IC1 and IC2. IC1 regulates the positive supply voltage while IC2 regulates the negative sup-

ply voltage. A voltage divider, connected between the two supply outputs and the control input of each regulator, insures that the two supplies track each other and maintain a constant output. Capacitors C3 and C4 provide additional filtering at the regulator outputs.

## CIRCUIT BOARD X-RAY VIEW

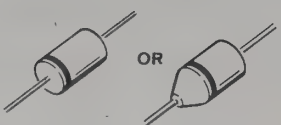
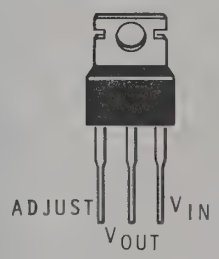
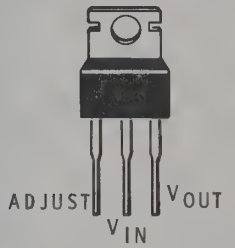
NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- A. Find the circuit component number (R3, C3, etc.) on the X-Ray View.
- B. Locate this same number in the "Circuit Component Number" column of the "Parts List" in the front of this Manual.
- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



VIEWED FROM COMPONENT SIDE

## SEMICONDUCTOR IDENTIFICATION CHART

SCHEMATIC NUMBER	HEATH PART NUMBER	MANUFACTURER'S NUMBER	LEAD IDENTIFICATION
DIODE			
D1, D2	57-65	1N4002	
INTEGRATED CIRCUIT			
IC1	442-708	LM317T	
IC2	442-709	LM337T	











**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

**DO NOT WRITE IN THIS SPACE****INSTRUCTIONS**

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (\$1.00 minimum, \$5.00 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

Total enclosed \$ \_\_\_\_\_

- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # \_\_\_\_\_ Invoice # \_\_\_\_\_

Date \_\_\_\_\_ Location \_\_\_\_\_

Purchased \_\_\_\_\_ Purchased \_\_\_\_\_

LIST **HEATH**  
PART NUMBER

QTY.

PRICE  
EACHTOTAL  
PRICE

TOTAL FOR PARTS

HANDLING AND SHIPPING

MICHIGAN RESIDENTS ADD 4% TAX

TOTAL AMOUNT OF ORDER

SEND TO: **HEATH COMPANY**  
BENTON HARBOR  
MICHIGAN 49022  
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY  
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
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Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY  
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR



# CUSTOMER SERVICE

## REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

## ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company  
Benton Harbor  
MI 49022  
Attn: Parts Replacement

**Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.**

## OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

## TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

**Please do not send parts for testing**, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

## REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

**If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.**

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least **THREE INCHES** of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company  
Service Department  
Benton Harbor, Michigan 49022





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